

Clean Water



Middle School / Natural Resources

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Idaho State Science Performance Standards:

- **ESS2-MS-4.** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- **ESS3-MS-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- **ESS3-MS-4.** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Science Practices:

- Analyzing and interpreting data
- Constructing explanations and designing solutions
- Developing and using models
- Engaging arguments from evidence
- Obtaining, evaluating, and communicating information

Cross Cutting Concepts:

- Patterns
- Cause and effect
- Systems and system models
- Energy and matter
- Stability and change

Idaho Math/ELA Standards:

ELA / Literacy Standards

- **RI.6.1** Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text
- **RI.6.7** Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue

- **RI.6.8** Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
- **RI.6.9** Compare and contrast one author's presentation of events with that of another
- **RI.6.10** By the end of the year, read and comprehend literary nonfiction in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.
- **R.L.6.2** Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
- **R.L.6.9** Compare and contrast texts in different forms or genres (e.g., stories and poems; historical novels and fantasy stories) in terms of their approaches to similar themes and topics.
- **W.6.1** Write arguments to support claims with clear reasons and relevant evidence. Introduce claims(s) and organize the reasons and evidence clearly.
- **W.6.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- **W.6.7** Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
- **W.6.9** Draw evidence from literary or informational texts to support analysis, reflection, and research
- **W.6.10** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- **L.6.6** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression
- **SL.6.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners expressing their own clearly.
- **SL.6.4** Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.
- **SL.6.5** Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
- **SL.6.6** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Mathematics Standards

- **6.SP.B4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
- **6.SP.B5** Summarize numerical data sets in relation to their context.
- **MP.2** Reason abstractly and quantitatively

Learning Objectives:

What will students be able to do, know, understand, etc?

1. Students will connect their understanding of water properties, from their hands-on experiments, to guide the direction of their engineering products when solving water issues.
2. Students will read literature and compare the topic to what they are learning in science, making comparisons to real-life situations.
3. Students will use technology to research a water issue of interest
4. Students will organize their research and work with team members to construct an argument explaining how their water issue is the most serious.
5. Students will demonstrate their understanding of the water cycle by constructing a comic strip, "The Journey of a water drop," using details and proper vocabulary.

Essential Question:

What is clean water?

Guiding Questions:

What questions will constantly focus the students on the Big ideas/Critical Question within the unit in student language?

1. Who is responsible for earth's water?
2. How does water affect your life?
3. How can we use data to inform us about our local environment?
4. Why do scientists collect and analyze data?
5. What is the importance of monitoring a natural resource over time?
6. In what ways should we protect our water?
7. How can we help prevent/solve water issues?
8. How can I demonstrate my responsibility for clean water?

Misconceptions/Evolving Conceptions:

What might students commonly misunderstand about the subject? How will I directly address these?

- We don't have any water issues other than pollution
- The serious water issues we do have in the world are only in 3rd world countries
- Glacier melting is not as serious a problem as the polar ice-caps melting
- There aren't any serious water issues that we can't see happening
- The pollution in the air has no effect on the toxic levels in the water

Scaffold of Activities:

What is your lesson sequence you will use to get students to the culminating project?

- Brainstorm everything you already know about water (see one example below)



Learn about water properties and the water cycle:

- Water Olympics (experiments demonstrating properties of water)
 - [Station Information](#)
 - [Water booklet link](#)
- Properties of water powerpoint including vocabulary and explanations:
 - [Properties of water powerpoint link](#)
- The Incredible Journey - A Physical interaction with the water cycle:
 - [The Incredible Journey Lesson Plan link](#)
 - [Station cards for the Incredible Journey link](#)
 - [Incredible Journey Recording Sheet link](#)
- Water cycle bag - (see copy of this lesson plan [here](#))
- My life as a water droplet comic strip
 - Grading rubric
 - [My Life as a Water Droplet Grading Rubric link](#)
- Socratic Seminar presenting problems facing the world - See lesson plan [here](#).
 - Note catcher for research
 - [Research Note Catcher link](#)
 - Source comparison tool:
 - [Source Comparison Tool link](#)
- Discuss what is the worst problem facing our waters today? (some examples below)
 - watershed model of pollution (local)

- Flint? (national)
- garbage patch? (global)
- oil spill (pipelines and drilling - deep water horizon)
- agricultural chemicals
- bacteria infiltrations (Quinn's Pond - local)
- drought and flooding
- Begin to design the project:
 - Discuss the scientific method vs engineering and design process:
[Engineering Design Process link](#)
 - Engineering process graphic organizer:
[Engineering Design Process graphic organizer link](#)
 - Engineering Progress Record to keep track of the group progress and hold members accountable for time usage:
[Water Issue Engineering Progress Record note catcher link](#)
 - Water Invention Write-Up Template to explain design:
[Water Invention Write-up Template link](#)



Cross Curricular Connection: *A Long Walk To Water*

This is a literacy unit connecting the novel by Linda Sue Park and topic of clean water together.

1. [Water For South Sudan](#) This is the original website that is the product of the novel itself. Plenty of teacher resources under the *Teachers and Students* tab, including a hyper doc and curriculum guide under the *Resources for Educators* sub category to help with lesson planning.
2. [ELA 7 Module 1 Unit 1 \(A Long Walk to Water\)](#) website with powerpoints for each chapter for the novel
3. http://www.uqp.uq.edu.au/skins/uqp/_uploads/TeachersNotes/A%20Long%20Walk%20to%20Water.pdf free online teacher's guide to aid in lesson planning

Ongoing Formative Assessments:

- Journal responses/reflections from lessons
- Class discussion
- Exit tickets
- STEM Engineering Graphic Organizer - See link above
- Water issue progress and presentation record - See link above
- Water Invention Write-Up - See link above

Summative Assessment / Culminating Project:

Students will choose a water issue (local, national or world) and design a solution to solve or mitigate the problem by building a prototype or model. Students will keep track of their group and individual team progress on a daily basis using the progress and presentation record (link above). Students will present their solution and be able to explain how the properties of water and/or the water cycle impacted their design solution.



Student inventions in action!

1. [Student Invention Demo 1](#)
2. [Student Invention Demo 2](#)

Additional Helpful Resources:

Sources for lessons, website, etc.

Personal water use activity: [How Much Water Do You Use? lesson plan and activity link](#)

Additional Water Cycle in a bag lesson plans:

- 1) [How To Make a Water cycle in a Bag alternative lesson plan link](#)
- 2) [Additional Water Cycle in a Bag lesson plan link](#)

Videos:

- Methane from fracking [Light Your Water on Fire from Fracking YouTube video link](#)
- Great Pacific Garbage Patch [Great Pacific Garbage Patch YouTube video link](#)
- *How will we rid the oceans of plastic?* [Inventor Boyan Slat YouTube video link](#)
A great example of a young scientists and engineers working together to solve the problem. Promotes the engineering process.

Websites:

- Design Challenge: [ScienceNetLinks Design challenge link](#) A great website promoting building and evaluating prototypes for water transport in a design challenge using a number of evaluation criteria.
- Water.Org : [Water.Org website link](#) A website which promotes the availability of clean water for everyone.
- Water Conservation Tips: [National Geographic Water Conservation Tips link](#)
- The Water Cycle Science Games: [Legends of Learning Water Cycle Games](#)

Slide presentations

- Clean or Dirty? [Clean or Dirty? Google slide presentation link](#)
- A slide presentation using slides depicting both for interactive with student audience
- An interactive water cycle slide presentation:
[The Water Cycle Interactive Google Slide presentation link](#)
- A water vocabulary slide presentation:
[Water unit vocabulary Google slide presentation link](#)
- A water properties slide presentation:
[Water Properties Animation Google Slide presentation link](#)